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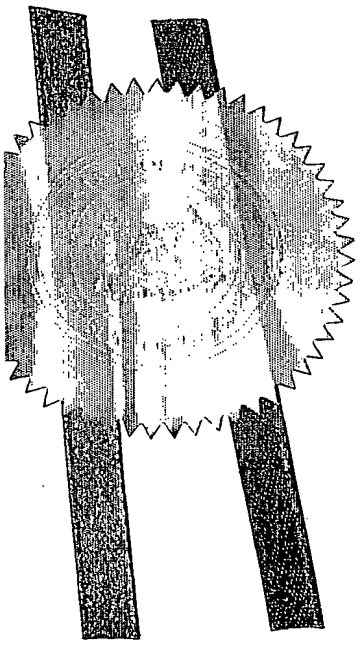
Date of Filing	:	02 AUG 2003
Application Number	:	200304231-4
Applicant(s) / Proprietor(s) of Patent	:	YONG, LIM YIN; GUEH, HOW KIAP
Title of Invention	:	METHOD AND APPARATUS FOR HULL INTEGRATED SEAWATER REVERSE OSMOSIS SYSTEM

Sharmaine Wu (Ms)
Assistant Registrar
for REGISTRAR OF PATENTS
SINGAPORE

10 Aug 2004



PCT/SG 2004 / 000232

ACTION

PATENTS FORM 1
Patents Act
(Cap 221)
Patents Rules
Rule 19

INTELLECTUAL PROPERTY OFFICE OF SINGAPORE

REQUEST FOR THE GRANT OF A PATENT UNDER SECTION 25

101101

* denotes mandatory fields

1 YOUR REFERENCE* 2003_ww30_02_water_treatment_vessel

2. TITLE OF INVENTION* **Method and apparatus for hull integrated seawater reverse osmosis system**

P03/77314
① $160/-
② $45/-
③ $9.50
2/8

3. DETAILS OF APPLICANT(S)* (see note 3) Number of applicant(s) 2

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State of incorporation State of residency SG

Country of incorporation Country of residency SG

[ ] For others (please specify in the box provided below)

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Patents Form 1

2 Aug '03

Page 1 of 5

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Country of residency: SG

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State of incorporation

Country of incorporation

[ ] For individual applicant

State of residency

Country of residency

[ ] For others (please specify in the box provided below)

[ ] Further applicants are to be indicated on continuation sheet 1

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4 DECLARATION OF PRIORITY (see note 5)

A Country/country designated

File number

Filing Date DD MM YYYY

B Country/country designated

File number

Filing Date DD MM YYYY

[ ] Further details are to be indicated on continuation sheet 6

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5 INVENTOR(S)* (see note 6)

A The applicant(s) is/are the sole/joint inventor(s) Yes [X] No [ ]

B A statement on Patents Form 8 is/will be furnished Yes [ ] No [X]

6. CLAIMING AN EARLIER FILING DATE UNDER (see note 7)

[ ] section 20(3) [ ] section 26(6) [ ] section 47(4)

Patent application number

DD MM YYYY

Filing Date

Please mark with a cross in the relevant checkbox provided below
(Note Only one checkbox may be crossed.)

[ ] Proceedings under rule 27(1)(a)

DD MM YYYY

Date on which the earlier application was amended

[ ] Proceedings under rule 27(1)(b)

7 SECTION 14(4)(C) REQUIREMENTS (see note 8)

Invention has been displayed at an international exhibition Yes [ ] No [X]

8. SECTION 114 REQUIREMENTS (see note 9)

The invention relates to and/or used a micro-organism deposited for the purposes of disclosure in accordance with section 114 with a depository authority under the Budapest Treaty

Yes [ ] No [X]

9 CHECKLIST*

(A) The application consists of the following number of sheets

i	Request	4	Sheets
ii	Description	8	Sheets
iii	Claim(s)	2	Sheets
iv	Drawing(s)	4	Sheets
v	Abstract (Note The figure of the drawing, if any, should accompany the abstract)	1	Sheets
	Total number of sheets	19	Sheets

(B) The application as filed is accompanied by

[ ] Priority document(s) [ ] Translation of priority document(s)

☐ Statement of inventorship & right to grant

☐ International exhibition certificate

10 DETAILS OF AGENT (see notes 10, 11 and 12)

Name

Firm: Lee & Yong Patent-Trademark Advisors Pte Ltd

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Building Name: Caltex House

Postal Code: 048622

12 NAME, SIGNATURE AND DECLARATION (WHERE APPROPRIATE) OF APPLICANT OR AGENT* (see note 12)
(Note Please cross the box below where appropriate)

☒ I, the undersigned, do hereby declare that I have been duly authorised to act as representative, for the purposes of this application, on behalf of the applicant(s) named in paragraph 3 herein

Name and Signature

DD MM YYYY: 02082003

Method and apparatus for hull integrated seawater reverse osmosis system

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for having a integrated fluid media filtration and membrane unit within the hull of a sea-bound vessel. The vessel's propulsion will drive the flow of seawater into the media filtration and membrane unit. Multiple stages of the passing of seawater via the membrane and/or a series of progressive membranes can be implemented to reduce the level of sodium chloride present in seawater to desirable specifications.

There are a variety of methods and processes that are currently deployed to make use of seawater as a desalination source, thereby creating new avenues whereby drinking water can be processed and utilized.

One such method is reverse osmosis of seawater, whereby seawater is removed of sodium chloride, and with further processing, including the irradiation of ultraviolet rays to destroy any bacteria or micro-organisms present to yield highly purified water that is suitable for applications that go beyond drinking water

It is commonly known that purified water (also called ultra pure water) increases the overall efficiency of turbines in a steam-powered powerplant, and due to the absence of a significant quantity of minerals (including sodium chloride), extends the operating life-span of the individual turbine blades.

There are already many geographical locations around the world today that are facing chronic shortages of drinkable water

Yet, the design, construction and operation of reverse osmosis plants are still expensive and therefore are generally out of the reach of many (in terms of cost of consumption versus the cost of conventional drinking water sources).

In the Republic of China for example, many regions near industrial zones are faced with the prospect of severe water shortages due to poor water

distribution networks, in-balances in the consumption of water by water intensive industries such as semiconductor fabrication etc.

The quality of water distribution networks cannot be under-estimated, in many cases, the amount of water available to a population of consumers and industrial users are greatly impacted by the efficiency of such networks.

Leaky pipes, corroded gaskets and faulty pipe pumps reduce the absolute water supply that can be distributed at any one time

However, the repair and maintenance of these networks is not easy nor affordable.

From an economic stand-point, the decision to distribute water via water pipelines or having vessels storing the water into tanks (and having them transported to the location for consumption) may be determined by factors such as cost, operating capability, consumption range etc.

The use of oil pipelines and oil tankers is one such example.

The price of drinkable water is indeed on par, if not more costly than crude oil in areas of the Middle East, making it economical to build desalination plants to make use of seawater for conversion into drinking water

There is already a growing trend in many places around the world whereby the price point of water may match the cost of crude oil imports (comparison by absolute volume).

It is therefore possible for sea-going vessels to transport purified water from an oil importing region to an oil exporting region, and return oil, in exchange for water, to the oil importing region.

It is also foreseeable that sea-going vessels may make use of the seawater to convert into purified water for storage on-board these vessels, for export to far flung regions, while making the cost of such water within reach of many (this is due to the multiple consumption markets that is within reach of the sea-going vessel capable of desalinating sea-water into fresh water).

The ability for water desalination systems to be mobile reduces the overall cost of purified water, by maximizing the reach of potential consumers while at the same time, reducing the need for capital expenditure in individual regions where desalinated water is desirable.

SUMMARY OF THE INVENTION

It is object of the present invention to provide for a method and apparatus for having a integrated fluid media filtration and membrane unit within the hull of a sea-bound vessel. The vessel's propulsion will drive the flow of seawater into the media filtration and membrane unit. Multiple stages of the passing of seawater via the membrane and/or a series of progressive membranes can be implemented to reduce the level of sodium chloride present in seawater to desirable specifications.

The present invention consists of a sea-going vessel, or any device capable of propulsion or floatation in areas where seawater or naturally occurring water is available

The said vessel will be constructed with suitable valves or openings capable of intake of seawater during the vessel's propulsion

In addition, the said vessel constructed with the said valves will also be capable of intake of seawater in a stationary position, having the said valve to be located within the level of seawater surrounding the said vessel.

The main function of the valves incorporated into the sea vessel hull is primarily to accept seawater via pipes connected to the said valves for routing of the said seawater into a suitable seawater storage tank.

The valves will be operated by means of a suitable prime mover such as an electric motor, AC alternator, or powerplant to ensure that the valve can open or close the valve opening to control the rate of seawater intake.

The construction of the valve may be constructed to be flush with the surface of the sea vessel hull, and may, optionally, include hardware that can prevent solid objects or other form of large particles to be filtered away from the valve opening.

Alternatively, the valve may be constructed to be protruding from either the hull surface, or surface area perpendicular to and/or along the length of the sea vessel.

The present invention will also include the construction of filters within pipes connected to the said valves to remove any media (or particles) that may accompany the intake of seawater via the valve.

The said pipes may also be fitted with membranes that can suitably remove a specific amount of sodium chloride and/or other impurities from the seawater being brought into via the said valves incorporated into the hull of the sea vessel.

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 illustrates a perspective diagram of a sea vessel with a valve fitted onto the surface of its hull.

Figure 2 illustrates a perspective diagram of a sea vessel with a valve combined with additional filters and at least 1 membrane to filter seawater incoming via the said valve to yield seawater with a reduced amount of impurities, such as sodium chloride.

Figure 3 illustrates filtered seawater incoming from the valve fitted onto the hull of the sea vessel, being routed onto a assembly of devices capable of performing reverse osmosis to further purify the filtered seawater.

Figure 4 illustrates a side view diagram of the major components and devices that are required for the processing and purification of seawater collected from valves constructed onto the hull surface of a sea vessel

Figure 5 illustrates the forward direction induced from the mechanical work imposed by a suitable powerplant unit installed within the sea vessel,

enabling seawater to be fed into the valves constructed to accept the intake of seawater.

Figure 6 illustrates how a suitable pump can be powered by auxiliary batteries charged by alternators connected to the sea vessel powerplant, enabling the said pump to continue feeding seawater into the pipes connected to the valves fitted onto the surface of the sea vessel hull, in the event whereby the sea vessel is stationary.

Figure 7 illustrates the construction of a valve assembly incorporated with a suitable reverse osmosis membrane for processing of seawater (stage 1) in a typical reverse osmosis process.

Figure 8 illustrates the construction of a valve assembly capable of routing seawater being treated by at least 1 reverse osmosis membrane, to a second valve and membrane assembly to further pass the said treated water to a second pass of another similar reverse osmosis membrane

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 illustrates a perspective diagram of a sea vessel with a valve fitted onto the surface of its hull

The vessel's hull 20 is partially submerged to the seawater level 10. Beneath the seawater level 10, a pre-treatment filter valve 30 is fitted to the vessel's hull 20

As the vessel moves along the water, jets of seawater flows into the said valve and directed into the pass reverse osmosis unit 40 installed in the vessel's body

Figure 2 illustrates a perspective diagram of a sea vessel with a valve combined with additional filters and at least 1 membrane to filter seawater incoming via the said valve to yield seawater with a reduced amount of impurities, such as sodium chloride.

An improved embodiment is to install additional filters after the seawater

collection valve R1. The seawater is passed into a membrane unit R2 and to further filter the seawater a second stage of processing R3 is added to further desalinate the seawater.

After the seawater water is processed, the purified water is stored into storage tanks R4 for storage and eventual consumption.

Figure 3 illustrates filtered seawater incoming from the valve fitted onto the hull of the sea vessel, being routed onto a assembly of devices capable of performing reverse osmosis to further purify the filtered seawater

In yet another improved embodiment, the untreated seawater is channelled through a pre-treatment filter valve G1, which segregates the unwanted solid matters from the seawater. The said solid matters may be organic matter like fish or inorganic matters like man-made rubbish floating in the seawater. The filtration also prevents the clogging to occur in the membrane unit G3

Figure 4 illustrates a side view diagram of the major components and devices that are required for the processing and purification of seawater collected from valves constructed onto the hull surface of a sea vessel

The seawater is first collected by the valve A-1 located at the front hull of the vessel. The system pump C-3 is required to pump the seawater into respective chambers for treatment. Treatment of seawater takes place at the membrane to 03 and ultra-violet irradiation unit B-2.

The vessel and the treatment plant is powered by a power plant located in the vessel with auxiliary batteries to serve as backup D-4 as well as the kick-starting of the treatment process

After treatment of seawater, the treated water is pumped into storage tanks E-5.

Figure 5 illustrates the forward direction induced from the mechanical work imposed by a suitable power plant unit installed within the sea vessel, enabling seawater to be fed into the valves constructed to accept the intake of seawater

The seawater flows into the valve as shown by the arrow 3000 whereby the vessel is partially submerged in the seawater. The vessel power is powered by the power plant 1000 in order to propel itself across the sea.

Figure 6 illustrates how a suitable pump can be powered by auxiliary batteries charged by alternators connected to the sea vessel powerplant, enabling the said pump to continue feeding seawater into the pipes connected to the valves fitted onto the surface of the sea vessel hull, in the event whereby the sea vessel is stationary

When the vessel is stationary, the auxiliary batteries s4 will kick-start the pump s5 and pumped the seawater into the valve to carry on the treatment process.

Figure 7 illustrates the construction of a valve assembly incorporated with a suitable reverse osmosis membrane for processing of seawater (stage 1) in a typical reverse osmosis process

Figure 8 illustrates the construction of a valve assembly capable of routing seawater being treated by at least 1 reverse osmosis membrane, to a second valve and membrane assembly to further pass the said treated water to a second pass of another similar reverse osmosis membrane.

Modifications within the spirit and scope of the invention may readily be effected by persons skilled in the art. It is to be understood, therefore, that this invention is not limited to the particular embodiments described by way of example hereinabove.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method and apparatus for a valve and pipe to be fitted onto a sea-going device for purposes of collecting seawater into the said device

2 A method and apparatus for a valve and pipe to be fitted onto the hull surface of a sea-going device

3. A method as claimed in claims 1 and 2, whereby the said pipe is constructed to route seawater from areas outside of the said sea-going device to at least 1 seawater storage tank within the sea-going device

4. A method as claimed in all the preceding claims, where the said pipes are adapted with a filter capable of removing impurities from seawater collected

5 A method as claimed in 1 and 2, including having said valve to be fitted with at least 1 device capable of accepting only seawater, and/or causing large particles accompanying said seawater to be removed from the said valve

6 A method as claimed in claim 2, including having said valve to be capable of opening and closing to control the intake of seawater

7. A method as claimed in claim 6, including said valve to be connected to a pipe to route seawater collected to a suitable seawater storage tank

8 A method as claimed in claims 2, 6 and 7, whereby the said pipes may direct the flow of seawater to a reverse osmosis device, or components of the said osmosis device

9. A pipe connecting to a valve fitted onto the surface of a sea-going device, containing a filtration device to remove and/or filter specific particles including sodium chloride molecules away from seawater collected via the said valve

10. An apparatus constructed to connect to the said pipe and valve assembly to further filter impurities from seawater collected via the said valve constructed onto the surface of the sea-going device

11 A method as claimed in claim 10, whereby membrane devices are fitted together with the said pipes

12 A powerplant with a mechanical coupling to drive an alternator to generate current for charging a connected battery, for purposes of using the said battery to operate a connected prime mover to feed seawater into valves constructed onto the surface of the hull of a sea-going device.

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ABSTRACT

Method and apparatus for hull integrated seawater reverse osmosis system

The present invention relates to a method and apparatus for having a integrated fluid media filtration and membrane unit within the hull of a sea-bound vessel The vessel's propulsion will drive the flow of seawater into the media filtration and membrane unit. Multiple stages of the passing of seawater via the membrane and/or a series of progressive membranes can be implemented to reduce the level of sodium chloride present in seawater to desirable specifications.

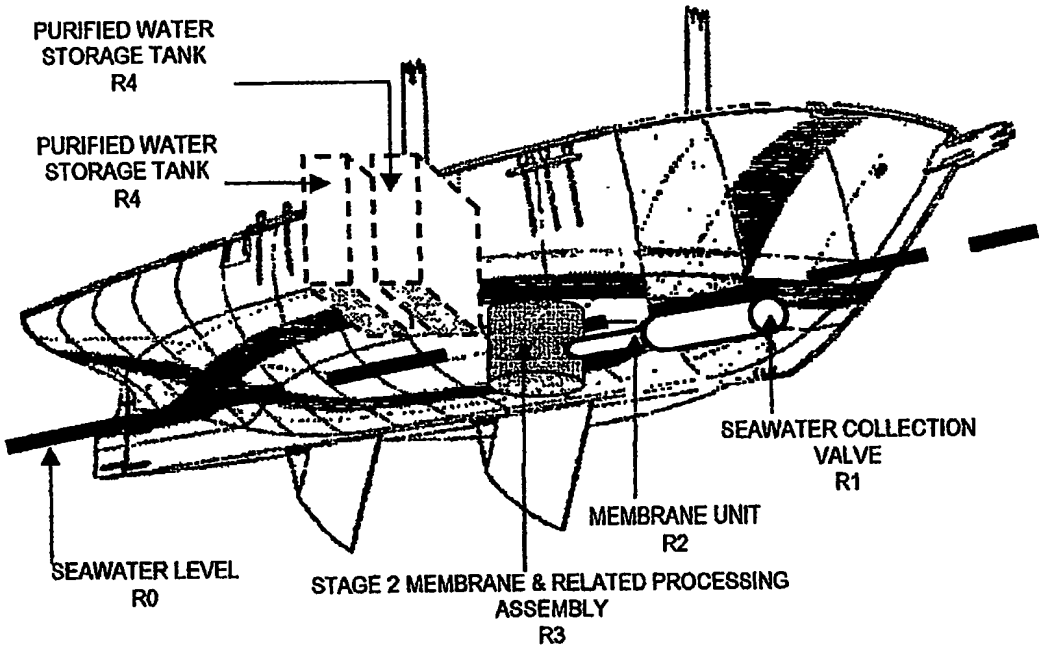

Figure 2 illustrates a perspective diagram of a sea vessel with a valve combined with additional filters and at least 1 membrane to filter seawater incoming via the said valve to yield seawater with a reduced amount of impurities, such as sodium chloride.

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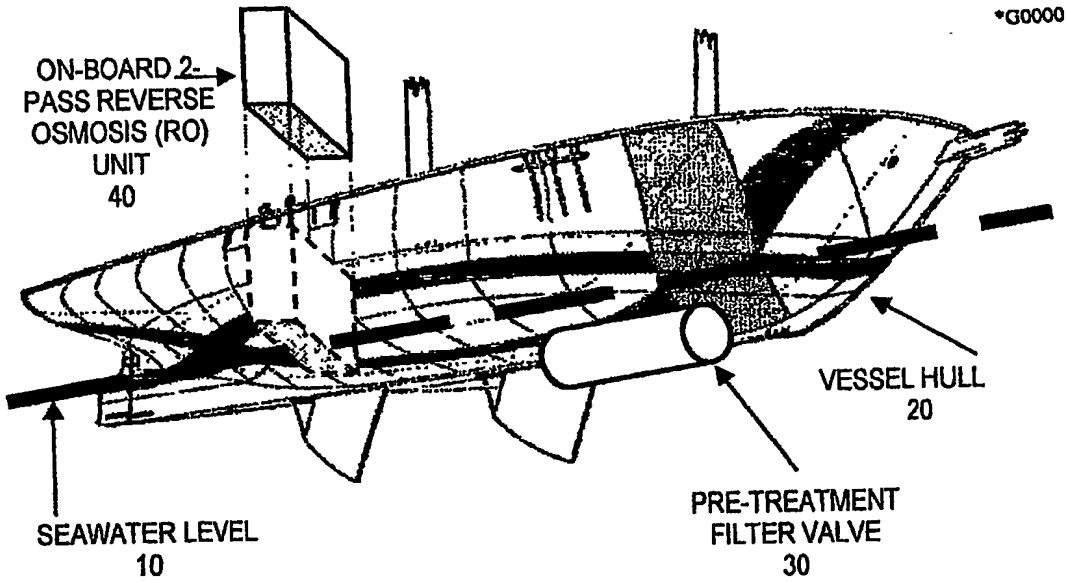
DRAWINGS



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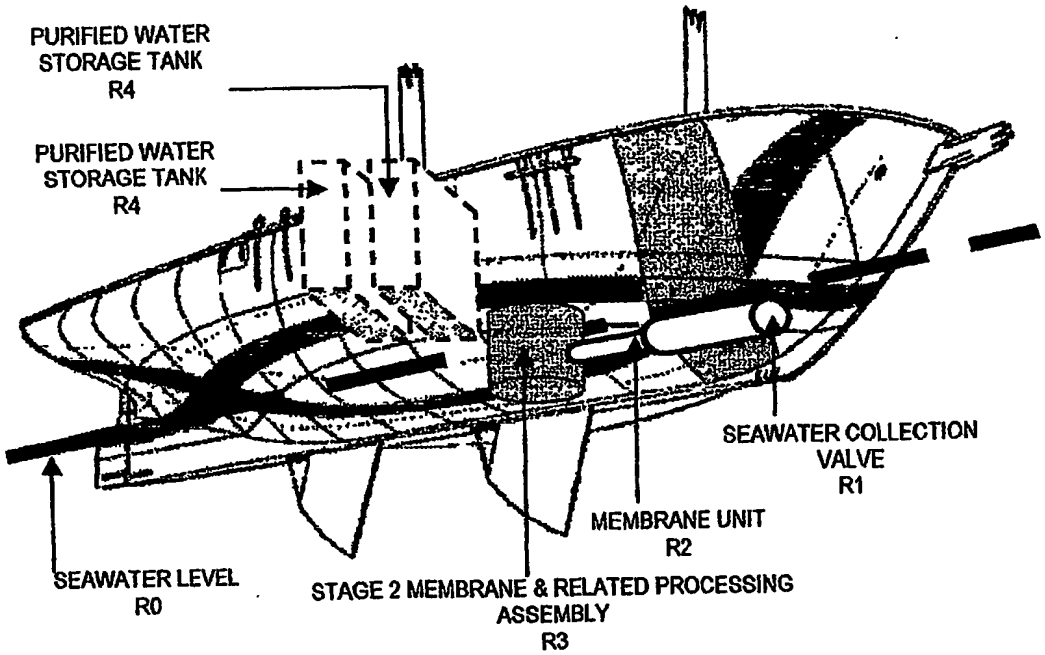

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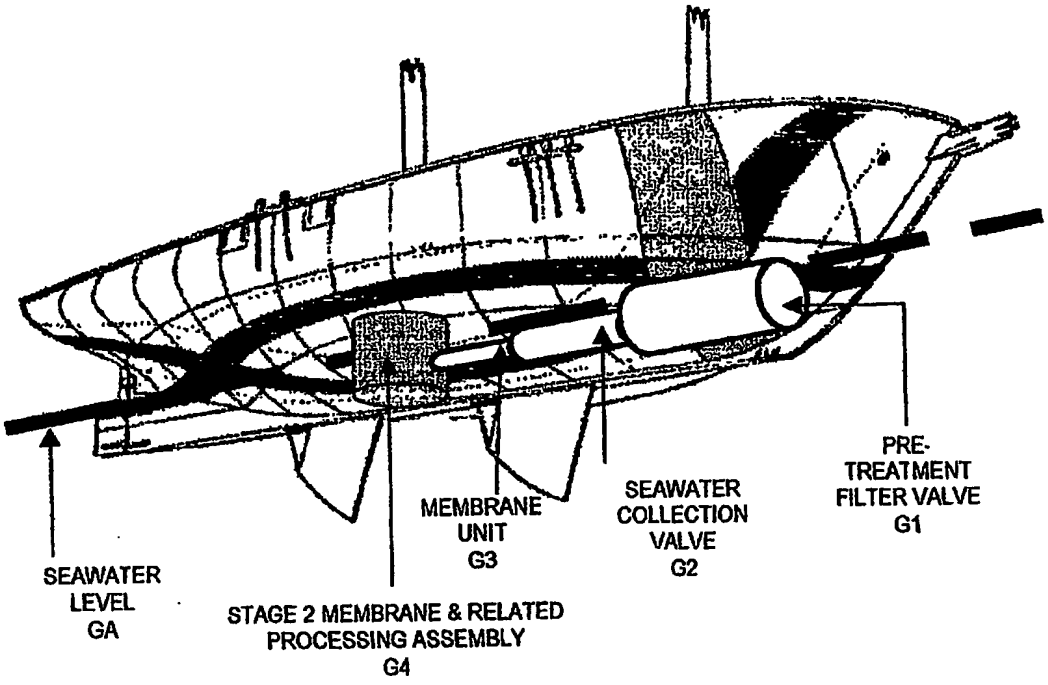

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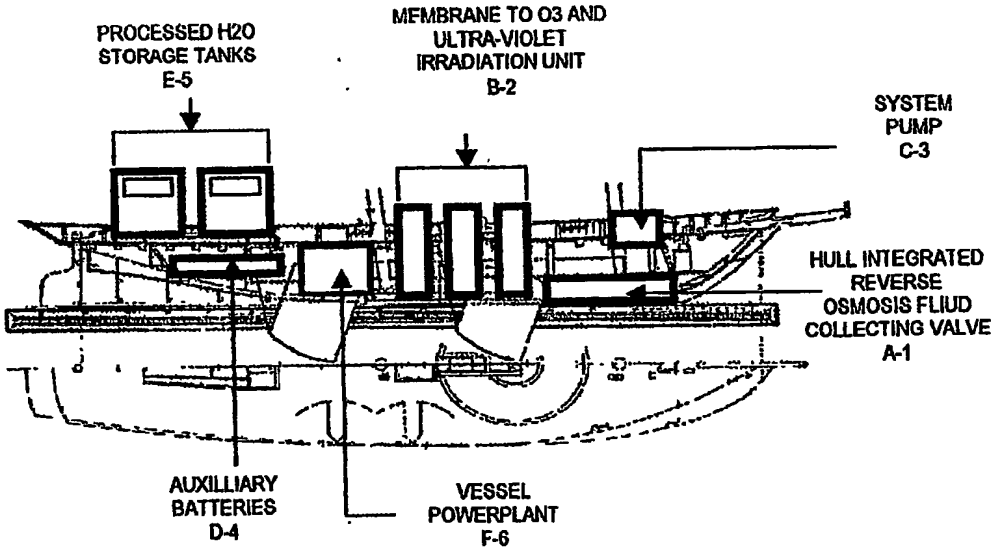

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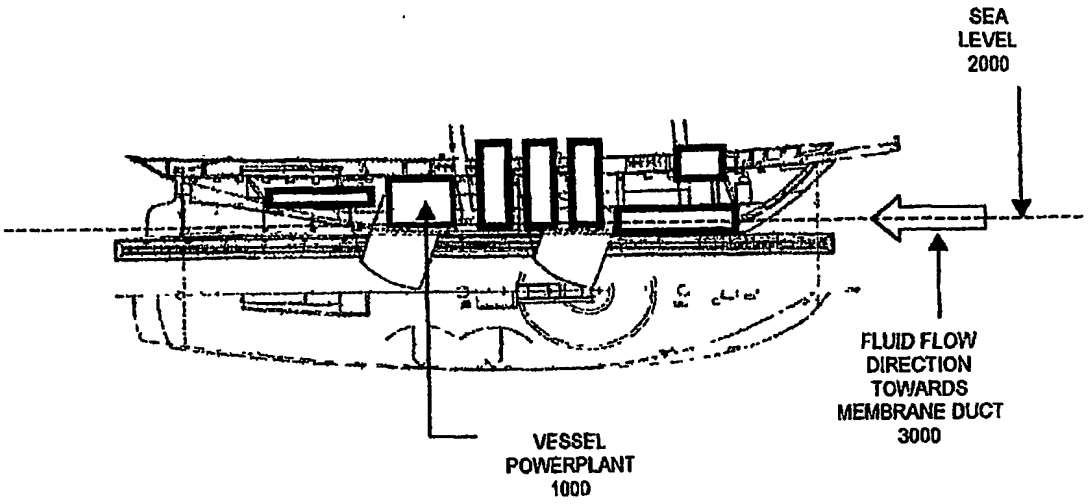

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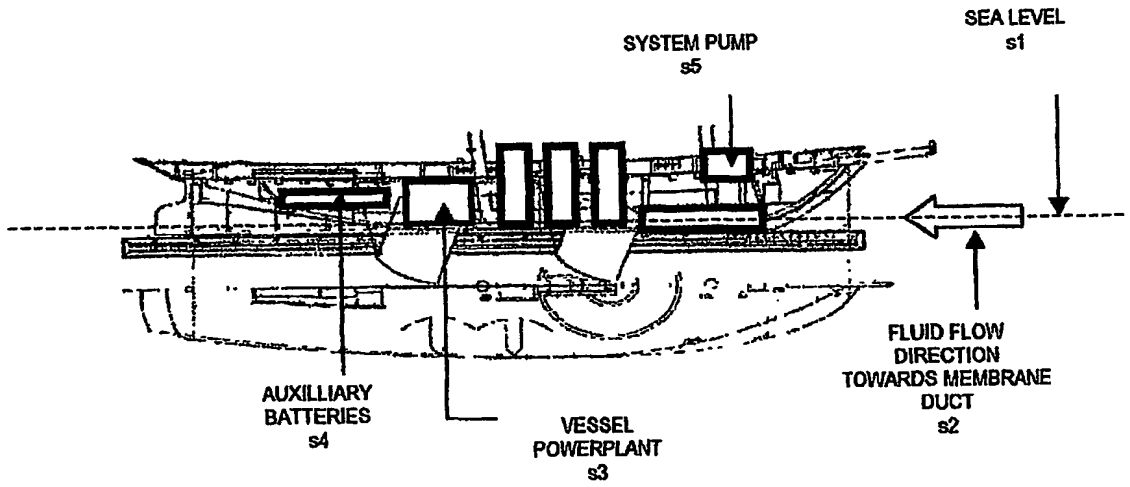

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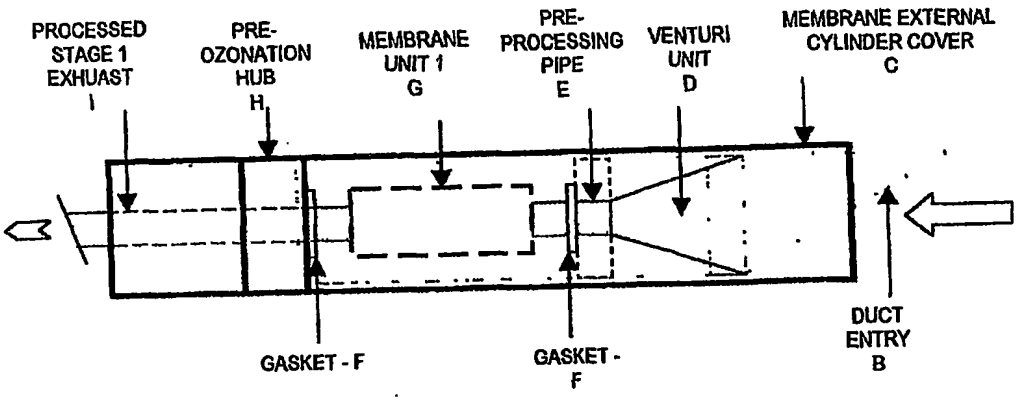

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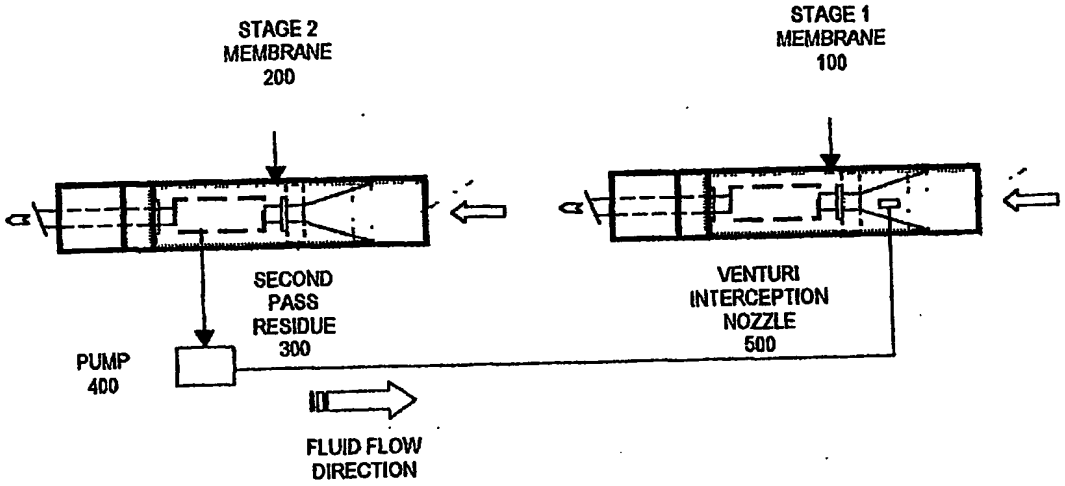

Figure 8 illustrates the construction of a valve assembly capable of routing seawater being treated by at least 1 reverse osmosis membrane, to a second valve and membrane assembly to further pass the said treated water to a second pass of another similar reverse osmosis membrane